CLAIMS

What is claimed is:

1. (Amended) A method of fabricating a protective layer on a semiconductor device, comprising:

providing at least one semiconductor die having an active surface with at least one bond pad exposed thereover;

selecting at least one portion of said active surface to be covered with at least a first layer of a protective material;

forming said at least a first layer with said protective material in an unconsolidated state at least over said at least one portion; and

selectively altering the state of said first layer of protective material over at least a portion of said at least one portion from said unconsolidated state to at least a semisolid state, while leaving protective material over other portions of said active surface in said unconsolidated state.

2. The method of claim 1, wherein said forming said at least a first layer of said protective material in said unconsolidated state comprises forming said at least a first layer with said protective material being in a liquid state.

3. (Amended) The method of claim 1, wherein said forming said at least a first layer comprises forming said at least a first layer of protective material in said unconsolidated state to have a thickness substantially the same as a desired thickness of said protective material in said at least a semisolid state over said at least one portion.

4. The method of claim 1, wherein said selectively altering comprises directing a controlled, discrete beam of radiation onto said protective material located over said at least one portion.

5. The method of claim 4, wherein said directing comprises directing a controlled, discrete beam of focused ultraviolet laser radiation.

6. (Amended) The method of claim 1, wherein said forming said at least said first layer comprises forming said at least said first layer from a liquid resin controllably curable to a solid state.

7. The method of claim 1, wherein said providing comprises providing a wafer having a plurality of semiconductor dice.

8. (Amended) The method of claim 1, further comprising:

selecting at least one second portion of said active surface covered with said at least a first layer of protective material to be covered with a second layer of protective material, said at least one second portion being superimposed, contiguous with, and mutually adhered to said at least one portion of said at least a first layer;

forming said second layer with said protective material in an unconsolidated state over at least said at least one second portion of said active surface; and

selectively altering the state of said second layer of protective material over at least a portion of said at least one second portion from said unconsolidated state to at least a semisolid state while leaving some protective material of said second layer over other regions of said active surface in said unconsolidated state.

9. The method of claim 1, further comprising removing at least some of said protective material in said unconsolidated state from said at least one semiconductor die.

10. (Amended) The method of claim 9, further comprising subjecting said protective material in semisolid state over at least one semiconductor die to a substantially full cure.

11. The method of claim 1, wherein said selectively altering comprises leaving protective material over said at least one bond pad in said unconsolidated state.

12. (Amended) A method of forming a layer of protective material on a specified area on an active surface of one or more selected dice of a plurality of semiconductor dice of a wafer, comprising:

selecting at least one portion of said active surface of each of the selected dice to be covered with the layer of protective material;

forming at least one layer of protective material in an unconsolidated state over at least said at least one portion of the active surface; and

selectively altering the state of said protective material of said at least one layer of protective material over at least a portion of said at least one portion of the active surface to at least a semisolid state, while leaving the protective material over other regions of the active surface in a substantially unconsolidated state.

13. (Amended) The method of claim 12, further comprising:

selecting at least one second portion of said active surface at least partially overlying said at least one portion of said at least one layer of protective material to be covered with a second layer of protective material;

forming said second layer with said protective material in an unconsolidated state over at least one second portion; and

selectively altering the state of the protective material of said second layer over at least a portion of said at least one second portion from said unconsolidated state to an at least semisolid state, said at least one second portion being superimposed over, contiguous with, and mutually adhered to said at least one portion of said at least one layer of protective material, while leaving protective material of said second layer over other regions of the active surfaces in said unconsolidated state.

14. (Amended) The method of claim 12, further comprising removing at least some of the protective material in said unconsolidated state from said active surface.

15. The method of claim 13, further comprising subjecting at least the protective material in said at least semisolid state to a secondary curing for further solidifying the protective material.

16. The method of claim 12, further comprising singulating at least the selected dice from the wafer.

17. (Amended) The method of claim 15, further comprising singulating at least the selected dice from the wafer.

18. (Amended) The method of claim 17, wherein said singulating is effected before said secondary curing.

19. (Amended) The method of claim 17, wherein said singulating is effected after said secondary curing.

20. The method of claim 12, wherein said selectively altering comprises leaving the protective material overlying regions of the wafer lying between adjacent ones of the selected dice in said unconsolidated state.

21. (Amended) The method of claim 12, wherein said forming said at least one layer of protective material comprises substantially completely covering the wafer with the protective material in said unconsolidated state.

22. The method of claim 12, wherein said selectively altering comprises leaving protective material over bond pads of the selected dice in said unconsolidated state.

23. The method of claim 12, wherein said selectively altering comprises subjecting said at least said portion of said at least one portion to a beam of radiation.

24. (Amended) A method for forming a protective layer on a selected portion of a surface of a semiconductor die, comprising:

providing the semiconductor die with an active surface thereof being attached to a lead frame of a lead frame strip;

supporting the semiconductor die on a platform with a back side of the semiconductor die being placed on said platform;

submerging at least the semiconductor die in liquid resin to form a layer of said liquid resin over said active surface; and

subjecting selected portions of said layer to a controllable beam of radiation to change said liquid resin in said selected portions to an at least semisolid state.

25. (Amended) The method of claim 24, wherein said subjecting comprises subjecting said selected portions to a beam of UV radiation.

26. (Amended) The method of claim 24, further comprising storing data including at least one physical parameter of the semiconductor die in computer memory and using the stored data in conjunction with a machine vision system to recognize the location and orientation of the semiconductor die and said selected portion.

27. (Amended) The method of claim 26, further comprising using the stored data, in conjunction with the machine vision system, to selectively form said layer of resin stereolithographically over said selected portion of said semiconductor die.

28. (Amended) The method of claim 24, wherein said subjecting comprises subjecting portions of said layer other than at locations of leads of the lead frame to said controllable beam of radiation.

29. The method of claim 24, wherein said forming comprises forming said layer with at least a portion thereof underlying a lead of the lead frame.

30. (Amended) The method of claim 29, further comprising removing at least some of said protective layer in said semisolid state from said active surface.

31. (Amended) The method of claim 30, further comprising subjecting at least said protective layer in said semisolid state to a secondary curing.

32. (Amended) The method of claim 31, wherein said secondary curing comprises increasing a temperature of said protective layer.

33. (Amended) A method for forming a protective layer on a selected portion of an active surface of a semiconductor dice of a wafer, comprising:

securing the wafer to a platform;

recognizing a location and orientation of at least one selected die of the wafer and bond pads on the active surface of said at least one selected die;

submerging said platform in a liquid resin to a controlled liquid depth at least over at least a portion of said active surface of said at least one selected die; and

subjecting at least one selected portion of said liquid resin over said active surface of said at least one selected die to a discrete beam of focused radiation to alter said liquid resin in said at least one selected portion to at least a semisolid state and form a layer of semisolid material adhered to said active surface.

34. (Amended) The method of claim 33, further comprising storing data including at least one physical parameter of said at least one selected die of the wafer, in computer memory, and using the stored data in cooperation with a machine vision system to recognize the location and orientation of said at least one selected die, and to control a

path of said discrete beam of focused radiation to stereolithographically form said layer of semisolid material.

35. (Amended) The method of claim 34, wherein said storing data comprises data for merging said at least one physical parameter for said at least one selected die with data for controlling said subjecting.

36. The method of claim 33, wherein said securing the wafer to said platform comprises stereolithographically forming wafer supports on said platform to horizontally secure the wafer.

37. The method of claim 33, wherein said securing the wafer to said platform comprises placing said wafer on said platform and stereolithographically forming semisolid edge supports securing an edge of the wafer to said platform.

38. A semiconductor wafer having a plurality of dice, each die having a protective layer on selected portions thereof, said protective layer on one of said plurality of dice being substantially discontinuous from protective layers on adjacent ones of said plurality of dice.

39. (Amended) The semiconductor wafer of claim 38, wherein each of said plurality of dice has conductors, said conductors of at least selected ones of said plurality of dice being exposed through said protective layer.

40. The semiconductor wafer of claim 39, wherein said conductors comprise bond pads.

41. (Amended) The semiconductor wafer of claim 38, wherein at least a portion of said protective layer comprises a thermoplastic material.

42. The semiconductor wafer of claim 41, wherein said thermoplastic material comprises an adhesive.

43. (Amended) A semiconductor device component having a layer of protective material on an active surface thereof, comprising:
a substrate with at least one conductor on the active surface thereof; and
a plurality of layers of at least semisolid photopolymer material on the active surface, said plurality of layers being superimposed, contiguous, and mutually adhered, each layer of said plurality of layers being substantially free of voids and air pockets, said at least one conductor being electrically exposed through said plurality of layers.

44. The semiconductor device component of claim 43, wherein said at least one conductor is laterally surrounded by said at least semisolid photopolymer material of at least some layers of said plurality of layers.

45. The semiconductor device component of claim 43, wherein a surface of said plurality of layers is planar.

46. The semiconductor device component of claim 43, wherein a surface of said plurality of layers is substantially parallel to the active surface.

47. The semiconductor device component of claim 43, wherein said substrate comprises a semiconductor die.

48. The semiconductor device component of claim 43, wherein said substrate comprises a wafer with a plurality of dice.

49. The semiconductor device component of claim 48, wherein said plurality of layers each exhibit a discontinuous region located over streets of said wafer between adjacent dice.

50. (Amended) The semiconductor device component of claim 43, wherein at least an outermost layer of said plurality of layers comprises an adhesive material.

51. The semiconductor device component of claim 50, wherein said adhesive material comprises thermoplastic material.

52. (Amended) A method for securing a component of a semiconductor device assembly to another component of the semiconductor device assembly, comprising:
providing the component, the component including a plurality of superimposed, contiguous, mutually adhered layers of material on a surface thereof, at least an outermost layer of said plurality of layers comprising an adhesive material;
aligning the component with the another component; and
securing the component to the another component with said adhesive material.

53. (Amended) The method of claim 52, wherein said providing comprises providing the component with at least said outermost layer of said plurality of layers comprising a thermoplastic material.

54. The method of claim 53, wherein said securing comprises heating at least portions of said thermoplastic material to at least soften said thermoplastic material.

55. (Amended) The method of claim 54, further comprising, substantially simultaneously with said heating at least portions of said thermoplastic material, heating at least one conductive structure of at least one of the component and the another

component to secure said at least one conductive structure to a contact of the other of the component and the another component.

56. The method of claim 52, further comprising securing at least one conductive structure of at least one of the component and the another component to a contact of the other of the component and the another component.